The influence of agricultural practices on aquatic habitat value of Sacramento River floodplains

Donald P Weston

Public Comments

No public comments were received for this proposal.

Initial Selection Panel Review

Proposal Title

#0258: The influence of agricultural practices on aquatic habitat value of Sacramento River floodplains

Funding:

Do not fund

Initial Selection Panel (Primary) Review

Topic Areas

- Environmental Influences On Key Species And Ecosystems
- Relative Stresses On Key Fish Species

Please describe the relevance and strategic importance of this proposal in the context of this PSP. How does the proposal address the topic areas identified above? What are the broader CALFED Goals this proposal may meet that are not accounted for in these specific topic areas?

The proposal specifically addresses the impacts of residual agricultural pesticides in sediments in the Yolo and Sutter Bypasses on benthic invertebrates that form an important prey base (or indicators of prey base) for key fish species, including Chinook salmon and splittail. As such, it is clearly relevant to the goal of building knowledge of the links between chemical and biological processes and key species and ecosystems in the Bay–Delta system. If, in fact, residual pesticides in bypass sediments are either limiting fish prey or accumulating in fish tissue from the consumption of benthic invertebrates (which is not a direct focus of this project), then a knowledge of the extent of such effects and the responsible mechanisms will be of significant aid in crafting policy and operational decisions about the use of the bypasses. The proposed work will also contribute to a better understanding of a potential stress on key fish species (a

depauperate or toxic benthos), although the work itself is not focused on the relative stresses identified in the PSP. The proposed work may also develop knowledge indirectly useful in several other topic areas, including water quality and salmonid−related projects. Increased knowledge of the persistence of the specific pesticides to be studied would appear to have broad utility in understanding water quality throughout the Bay−Delta system. Because of the importance of benthic prey to salmonids and the extensive use of pesticides throughout the Bay−Delta catchment, increased knowledge of the effects of residual pesticides on benthic invertebrates would seem to have broad utility.

The budgets of proposals submitted in response to this PSP are larger, on average, than those submitted to CALFED in previous years. The Science Program is committed to getting as much science per dollar as is reasonably possible. With this commitment in mind, can the proposed budget be streamlined? If so, please recommend and clearly justify a new budget total in the space provided.

Based on the reviews, the budget appears appropriate and proportional. None of the reviewers nor the Technical Synthesis Panel provides any suggestions for budget streamlining, and I do not have the expertise to identify any opportunities.

Evaluation Summary And Rating.

Provide a brief explanation of your summary rating and any additional comments you feel are pertinent.

It is very difficult to provide an a priori rating of this sort at this stage of the process. Based on the reviews and Technical Synthesis Panel evaluation (Above Average), I think the proposal is worthy of funding, but it will be competing with quite a few other proposals of similar merit, so it is likely to be the balancing criteria that determine its final rating.

Selection Panel (Discussion) Review

fund this amount: $**0**
note:
do not fund

The proposal addresses several goals of this solicitation and addresses important questions about the "dual–use" of floodplains as agricultural areas and critical rearing areas for fish species. The proponents emphasize toxicological issues over ecological processes and the Panel acknowledged that this could be interpreted as a benefit (increased focus) or a detriment(lack of integration with certain important CalFED management concerns). The Panel was concerned that the proposal lacked a strong hypothesis–testing framework or a well–articulated statistical sampling design. Also, the Panel noted that concerns about access to privately–owned lands are not circumvented by the right of public–access to navigable waterways, as anticipated by the proponents.

First, in years without substantial precipitation, the researchers will not be able to access areas that only flood in wet years. Secondly (and more importantly), the public access to navigable waters will not permit proponents to sample the soils and benthic communities underneath those navigable waterways. Proponents would need to obtain, in advance, legal permission to sample soils and benthic communities in the Yolo Bypass. The panel believed that research has already demonstrated the value of the bypass to rearing fish. Even if this study succeeded (despite the technical and logistical problems identified above), it is not clear that those results will lead to enhanced understanding of key questions related to the habitat value of the bypasses.

Panel Ranking: Do not fund

Collaboration Panel Review

Proposal Title

#0258: The influence of agricultural practices on aquatic habitat value of Sacramento River floodplains

Final Panel Rating
above average

Collaboration Panel (Primary) Review

Collaboration:

Will the results of the collaborative effort be greater than the sum of its parts? Is it clear why the subprojects are part of a larger collaborative proposal rather than several independent smaller ones?

adequate
Collaboration between the sub−task managers during the conduct of the investigation is not specified. Once the work in individual sub−tasks is completed the resulting evaluation and end−products will depend on collaboration amongs those sub−task managers.

Interdependence And Integration:

Does the proposal have an example that clearly articulates the conceptual model of each subproject and how they link together as a whole? Are the boundaries of the study plans focused and cohesive, yet well delineated? Is there a plan for potential differences in the stages of subproject completion times? Are there clear plans for analyses and interpretations which seek to identify and quantify relationships among the data collected in various subprojects rather than separate analyses for each subproject?

above average
A conceptual model of the sub−task linkages is presented in Figure 2 (page 16). The sub−tasks are clearly distinguishable. Ongoing work by the participants in relevant external investigations, which is beneficial to the conduct of this project, is identified in the Description section (page 19).

Project Management:

Is it clear who will be performing management tasks and administration of the project? Are there resources set aside for project management and time given for investigators to collaborate? Is there a process for making decisions during the course of the project? Are there acknowledgments of potential barriers to collaboration and explanations of how team members will overcome barriers particular to their institutions?

above average
The text identifies the managers of the various project elements. Task 5 in the Description section (pages 14–18) and in the Task and Budget forms identifies work, staff time and budget for program management and reporting of results. The program schedule is presented in the Schedule section (page 20) together with a discussion of alternatives if scheduled work is not completed. There is no discussion how to overcome barriers to collaboration.

Team Composition:

Does the lead principal investigator have successful management history and experience leading collaborative teams? Is it clear that all key personnel are committed to making significant contributions to the project? Do team members have complementary skills?

adequate
The text indicates the Lead Investigator has had comparable collaborative management experience, but no specific examples are described. The key personnel all seem well qualified and some have considerale experience in relevant local investigatons; their skills are complementary and sufficient time has been budgeted (Budget form) to allow them to make significant contributions.

Communication Of Results:

Is there a clear plan for comprehensive and cohesive reporting of project progress to the CALFED community?

above average
There is a clearly defined plan to communicate results. Task 5 addresses how the results will be communicated and who will be

involved in the effort. Specific venues for the presentation of results are identified and the number and type of these presentations are described. Funds identified for these activites in the Budget form appear adequate.

Additional Comments:

Collaboration Panel (Discussion) Review

Primary reviewer judged that the project would result in an improved understanding of the topic, and felt the communication of results and project management were well defined. The secondary reviewer agreed, and observed that even the outreach effort is above standard. The only reason why the proposal did not rate as superior was because both reviewers felt the proposal did not include conceptual models of the subprojects nor describe how the integration of the subprojects would be accomplished at the project's end.

Technical Synthesis Panel Review

Proposal Title

#0258: The influence of agricultural practices on aquatic habitat value of Sacramento River floodplains

Final Panel Rating
above average

Technical Synthesis Panel (Primary) Review

TSP Primary Reviewer's Evaluation Summary And Rating:

The project will examine the Yolo and Sutter Bypass areas as seasonally inundated flood regions that serve as forage areas for critical fish species and also as agriculture areas. When inundated, the areas will be sampled with sediment cores for: sediment pesticide analysis, sediment toxicity testing, and macroinvertebrate analysis. The project will also study pesticide use records for the area. This study will also continue ongoing efforts to better quantify laboratory exposure testing for the pesticides of interest (primarily pyrethroids, endosulfan, Chlorpyrifos) and will evaluate aquatic persistence of pyrethroids. The project goals are well defined and a good research plan is given. The expertise of the scientists involved appears to be very good with Weston supervising and conducting the toxicity testing. He plans to coordinate field sampling with Sommer of the Dept of Water Resources and to coordinate crop data with GIS format through Zhang of UC Davis. Johnson of UC Davis will assist with macro-invertebrate analysis and Lydy of Southern Illinois University will conduct the pesticide analysis. Overall, I think that the study should be very valuable and a high priority. If criticisms of the external reviewers could be overcome, I think that it could be viewed as very good.

Additional Comments:

The proposed study is somewhat descriptive and hence the lack of clear hypothesis is of less concern than might be the case otherwise. However, the integration of data from the sutdy to management practices is somehting that could possibly be improved. I think that the information on pesticide impact on fish foraging in the bypass area should be considered of high priority.

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Technical Synthesis Panel (Discussion) Review

TSP Observations, Findings And Recommendations:

The panel felt that the impact of agricultural pesticide use in the bypass areas on foraging fish is important. The proposed research is likely to contribute to our scientific

understanding of these topics, and would be conducted by a capable and experienced research team. The research team has current related research and a good track record with Delta projects. However, the external technical reviewers made a number of minor substantive comments, that if addressed would improve the proposed research. Thus, the panel rated this proposal Above Average.

Technical Review #1

proposal title: The influence of agricultural practices on aquatic habitat value of Sacramento River floodplains

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**Yolo Bypass (and probably Sutter Bypass) serve critical ecological roles for juveniles of several fish species in the Sacramento River system. They also serve as agricultural production areas during dry periods, during which time they receive considerable pesticide application. The degree to which pesticide residues in the soil "limit" the production of the fish prey base (macroinvertebrates) during inundation and fish use is an important research question.** **The proposed research has the potential to provide important, new information of direct relevance to the sustainability of current agricultural practices and fish use of the Yolo and Sutter bypasses. The proposal is well written and clearly lays out how the rationale and methods for the field sampling and toxicity testing will be produce the information that satisfy the stated goals.**
Rating	**excellent**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**A weakness in the proposal is that there is no explicit "conceptual model" that links spatial and temporal variation in pesticide application (and soil residues) to benthic invertebrate population dynamics and temporal exposure to and uptake of pesticides. The proposal is very strong on the toxicology side, but does a weaker job of ecological characterization. Some adjustments in the design would, I believe, produce more ecologically relevant results, as outlined below.**
Rating	**good**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**This proposed research follows well from previous research on toxicity to aquatic invertebrates in the region, much of that previous work being conducted by the proposers. The evaluation of residual sediment toxicity on benthic invertebrates that are at the base of the fish food chain is an important question that generate quality knowledge of high interest to managers and decision–makers. I think the design is appropriate from the perspective of soil sampling, sediment testing, and toxicity testing in the lab. Indeed, the proposers appear to be leaders in this research area. However, I am less confident that the ecological characterization of the benthic communities across the spatial extent of the bypasses is adequately captured in the project design. I discuss these below.**
Rating	**very good**

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**What I particularly wonder about is the spatial characterization of the benthic communities vis-à-vis the pesticide applications. I am assuming (since no description is provided in the proposal) that the benthic invertebrates colonize from the river or inflowing streams each year. Thus there is some kind of hydraulic landscape that regulates delivery via the drift of ultimate distribution of benthos across the bypass landscape. The "turnover" of individuals at each site is also important, because the residence time at a site will influence the extent of exposure to, and uptake of, pesticide. It is well understood in stream ecology that the flux of organisms in a locale is often related to the current velocity of the environment, so sample sites in fast-flowing areas (or in more drift-rich areas, or areas closer to the river/stream source populations) may have higher turnover and/or greater invertebrate densities (since insects do not complete their life cycles in the benthos). All these issues suggest the possibility that invertebrate response variables in a given sample be decoupled from the soil toxicity. These issues should be addressed, yet I see nothing in the design that might account for this. At the least there should be some "mapping" of the inundation history and velocity gradients across the floodplain to help account for statistical variation in the results. In light of this I question whether the "30-35" sample sites will suffice.** **Along a similar vein, I agree that sampling "natural substrate" is important in this project, and therefore sampling via artificial substrates (as in the "COYOTE" proposal) is inappropriate. However, if samples in this project come from dead crop material that acts as benthic structure and habitat, will the organisms have**

contact with the contaminated sediment, i.e., will the main objective be met? How will this be assessed?

I would like to see more justification for the use of C. tentans as the toxicity testing species. This species is stated (p. 11) to be of "critical importance … as prey for both splittail and salmon," which implies the species is in fact a native one; however, I find it curious this is not expressly stated as is the case for H. azteca ("a Central Valley resident" on p. 9). In any case, the actual importance of this chironomid is never demonstrated with data or a references – it is simply asserted. My concern is how well toxicity results for this particular species might translate into higher trophic levels. Although, C. tentans is an EPA standard guinea pig, the question is how transferable are toxicity results for it to the whole community (or other "dominant" prey items) for salmon? I would like to see some dietary analysis of salmon to justify the reliance on C. tentans, or lacking such knowledge, some "whole community testing" for the assemblage of chironomids comprising the salmon prey base, as this could be potentially much more ecologically realistic, which is the ultimate goal here, I think. I would encourage more thinking along these lines in future proposals.

On a related issue, I believe it is a shortcoming NOT to identify chironomids in benthic samples to any finer taxonomic level than family. The relative proportion of various taxa and their biomass is important ecological information that should be collected in this study. It is, in fact, quite feasible to identify chironomids to sub−family or tribe level, and genus is not out of the question (EPA does this for their national EMAP program). Tribe or genus level information allows ecological inference into habitat preference and trophic relations, and it allows a useful description of taxon diversity in samples. Indeed, the community composition for chironomid taxa will probably vary across the bypass,

	perhaps in response to sediment toxicity, benthic organic matter (crop), or water velocity (and drift distance from the river source?). Further, C. tentans should specifically be enumerated in the samples, to allow some extrapolation of the toxicity testing to the invertebrate communities.
Rating	good

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	N/A
Rating	not applicable

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	Although I believe there are some shortcomings in the proposal (especially in terms of what can be strongly said about the ecological relevance of the results), I also think this work will shed important, new light on a potentially critical “limiting factor” on the ecological value of Yolo and Sutter bypasses. More information is certainly needed to understand if fish using these floodplains are at risk from residual pesticides. This project would set a “base−line” that could certainly inspire more detailed characterizations (of the type hinted at above).
Rating	very good

Additional Comments

Comments

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	**Yes. Experts on aquatic toxicology, benthic invertebrates, and fish use of the bypass are involved.**
Rating	**excellent**

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	**It appears reasonable for the number of participants and the level of labor involved.**
Rating	**good**

Overall

Provide a brief explanation of your summary rating.

Comments	**I believe this proposal has much merit and will provide some significant new insights and stimulate further research into how fish use the Yolo and Sutter bypasses and how these critical habitats may need to be managed. This is important research. However, as I have stated numerous times above, I think the proposal is too short on "ecology" and I have some concerns about how well the design will allow the kinds of ecological inferences desired by the proposers.**
Rating	**very good**

Technical Review #2

proposal title: The influence of agricultural practices on aquatic habitat value of Sacramento River floodplains

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**The objective of the project, to examine agricultural practices in the bypasses and how they may affect the forage value of the lands to key fish species once the bypasses are flooded, is clearly stated and internally consistent. I was unable to find any hypotheses stated, and having testable hypotheses would strengthen the proposal substantially. The idea is timely and important as increased attention is being given to multiple−use areas and to the degree of compatibility of agriculture with aquatic conservation objectives. The project could be made even more relevant by a greater focus on evaluating toxicological impacts of agriculture outside the bypasses but within the watershed, as there is very little information on the scales and configurations of watershed land uses that affect aquatic habitats and species.**
Rating	**good**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**The study appears justified relative to existing**

	knowledge, as it builds on prior work on fish forage, macroinvertebrate communities, and toxicity, and attempts to fill in key data gaps that presently hinder a full evaluation of pesticide impacts on the bypasses. There is no conceptual model given, and having one would strengthen the proposal by showing how the different tasks relate to each other. However, the 'Project Purpose' section clearly lays out a basic framework and provides sound justification for the work. The selection of a regional project focusing on the two main bypasses seems appropriate to the question being asked, broad enough in scale to allow for stratification and replication of sites, but not so extensive geographically that the project becomes infeasible.
Rating	**very good**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**The approach appears well designed and appropriate for meeting the objectives of the project, with a few relatively small exceptions. 1) The authors say in the 'Project Purpose' that 'there is much evidence that the Yolo Bypass has greater diversity of fishes than the main Sacramento River channel and provides critical habitat for many species of splittail and salmon.' I would like to have known if there is any evidence suggesting reduced forage for these fish in the bypass, OR any evidence of bioaccumulation of toxics. Without this information, it is difficult to judge if perhaps there is a missing piece to the approach, namely a fish-focused task that examines foraging success and/or bioaccumulation, both within the passages and relative to the main channel or other waters. Given that the main objective is tied to fish,**

it seems a bit unusual that there is no fish component to the project -- though I understand that including fish would greatly expand the project, and I appreciate the relatively contained scope of the project as proposed. 2) It is a bit unclear if field sample sites will be stratified based on inherent characteristics like soil type. This may be irrelevant, but it would help to have that addressed. 3) The macroinvertebrate community analysis is an important part of the project. I would like to see some discussion of potential factors affecting abundance and biomass in addition to crops and pesticide treatment. For example, the existence of riparian buffers along the tributaries could have an inpact, as could a host of other land uses within the watershed. 4) The authors note in Task 2.1 that field sampling of creeks and sloughs may occur at or near road crossings. I wonder if those road crossings in themselves could influence the results due to sediment transport. Also, as noted above, riparian conditions could be an important factor to consider. 5) Related to #3, the proposal could use more detail about how watershed effects will be separated out from bypass pesticide applications. Perhaps Task 2.4 could include analysis of macroinvertebrate abundance and biomass against crops and pesticide treatment in watersheds. Location of crops within watershed could be weighted to reflect distance from the bypass and/or amount of surface runoff, using measured or modelled hydrologic data.

The results are likely to add to the base of knowledge, especially vis-a-vis aquatic persistence of pyrethroids, which seems to be a critical data gap, particularly when coupled with sediment transport times to the bypass and from the bypass to the main channel. The project appears to be based on tested methods rather than designed to generate new ones. The information generated appears directly relevant to decision-makers; in the Executive Summary the authors say that they will suggest management measures, and

	this should be a key output of the project (though how these recommendations will be developed and the topics they will cover is less clear).
Rating	very good

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	The approach appears to be fully documented and technically feasible, provided that the researchers are able to acquire pesticide data from the County Commissioners in order to complete Task 1. The likelihood of success seems relatively high, given that the project builds on past efforts. The scale of the project, as noted above, seems consistent with the objectives and within the grasp of the authors.
Rating	very good

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	Monitoring is not applicable to this project as designed, though replicate sampling before, during (more than once), and after flooding would be ideal (best would be over more than one year).
Rating	good

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	**As noted above, the products of greatest value to come from this project, as currently designed, may be the aquatic persistence of pyrethroids data, which should be widely applicable within and outside the CALFED region. Contributions to larger data management systems are not explicitly considered. Interpretive outcomes are likely from this project, thought hey will be of a limited nature given the complex set of stressors affecting forage in the bypasses, and the unusual nature of the bypasses themselves.**
Rating	**good**

Additional Comments

Comments	**Please note that I would have preferred to leave the 'monitoring' rating blank, as it seems less applicable to this proposal.**

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	**The track records of the authors appear to be strong in terms of past performance. The project team is qualified to efficiently and effectively implement the proposed project; however, having additional access to expertise in hydrology, biogeochemistry, and limnology would strengthen the project by expanding potential insights into holistic system functioning. The team appears to have available the necessary infrastructure and support to accomplish the project.**
Rating	**very good**

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	**The budget seems adequate. It is difficult to judge if the budget is reasonable without knowing if the lead P.I.'s salary is comparable or excessive compared to that of other researchers, and also without knowing more details of the subcontract awards.**
Rating	**good**

Overall

Provide a brief explanation of your summary rating.

Comments	**I would give a summary rating of Good. While I assessed several of the individual categories as Very Good, the lack of testable hypotheses and the lack of details about how the various data streams will be integrated to produce management recommendations are weaknesses. With these pieces addressed, the proposal would be very good. Overall, I think that the proposal's greatest asset is its focused and contained nature, marshalling a number of related tasks to address a single question.**
Rating	**good**